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HEWLETT PACKARD COMPANY
P O BOX 272400, 3404 E. HARMONY ROAD
INTELLECTUAL PROPERTY ADMINISTRATION
FORT COLLINS, CO 80527-2400

EXAMINER	
CHANKONG, DOHM	
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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/872,970
Filing Date: June 01, 2001
Appellant(s): REUTER ET AL.

Jed Caven
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 12/19/2005 appealing from the Office action mailed 10/6/2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5404351	Casorso et al	4-1995
6260120	Blumenau et al	7-2001

Microsoft Computer Dictionary, 5th Edition (2002), p. 558.

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

1> Claims 1-30, 34 and 36-40 are rejected under 35 U.S.C § 103(a) as being unpatentable over Blumenau et al, U.S Patent No. 6.260.120 ["Blumenau"] in view of Casorso et al, U.S Patent No. 5.404.361 ["Casorso"].

2> As to claim 1, Blumenau discloses a virtual storage system for linking a host to one or more storage devices over a network, the system comprising:

an agent connected to the host, the agent having volatile memory for storing a first copy of a table, the table having entries to map virtual addresses (ports) to locations on the storage devices [Figure 4 «item 35» | Figures 23-25, 30 | column 14 «lines 23-31» | column 25 «lines 50-56» where : Blumenau's port adapter 35 corresponds to claimed agent, the port adaptor relying on RAM to store information]; and

a controller coupled to the agent, the controller having non-volatile memory for storing a second copy of the table [Figure 21 «item 27» | column 14 «lines 31-33» | column 21 «lines 35-40» | column 32 «lines 43-54» where : Blumenau discloses that a copy of table is placed in the storage volume, allowing for table recovery during port adaptor error recovery or diagnostics. The storage volume (controller) and the port adapter (agent) are two separate elements];

whereby during an I/O operation, the host accesses one of the entries in the table stored on the agent to determine one of the storage device locations [column 23 «lines 49-59» | column 25 «lines 50-58» | column 26 «lines 28-36» where : the "Report LUNs" command allows hosts to retrieve information from the mapping tables located at the port adaptor. Blumenau discloses a "volume access and mapping table". Therefore the mapping table is accessed whenever a volume needs to be accessed].

3> Blumenau fails to expressly disclose that his storage volume (controller) coupled to port adaptor (agent) intermittently causes contents of the first copy of the table [at the host

controller] to be replaced by contents of the second copy of the table [at the controller]. However it is clear from Blumenau's specification that the purpose of the storage volume back-up is enable recovery of table information when the port adaptor fails or during diagnostics. Blumenau discloses the back-up copy is especially useful for "port adapter error recovery" [column 21 «lines 35-40»]. Blumenau further discloses a purpose of his invention is to make it "possible to back up and restore the host-to-volume connectivity configuration information" [column 45 «lines 3-4»]. Conceivably, the concepts of a back-up table and recovery would lead one of ordinary skill in the art to reasonably infer that the purpose of Blumenau's back-up table is to restore (replace) the contents of the primary table located in the port adaptor whenever there is an error with the port adaptor or its table. Therefore, it is obvious [Examiner's note: the final rejection used the word "inherent". This was an Examiner's error and intended to use "obvious"] in Blumenau's system that the back-up table located at the storage volume will intermittently replace contents of the first table located in the port adaptor during times of failure of error.

4> Further, Blumenau discloses mapping virtual ports (addresses) to physical locations on a drive but does not explicitly disclose mapping virtual disk positions on the storage device. In a same field of invention [Figure 1], Casorso is directed towards providing error check functionality to a dynamically mapped storage system. Additionally Casorso discloses a mapping table, the table having entries to map virtual disk positions to locations on the storage devices [column 1 «lines 37-42» | column 3 «lines 18-38» | column 6 «lines 60-66» | column 8 «lines 5-23»]. It would have been obvious to one of ordinary skill in the art to

modified Blumenau's mapping table with the functionality of Casorso's mapping table to enable the mapping of the virtual disk positions to their counterparts on the physical drive. The benefits of such a mapping are well known in the art such as providing a level of abstraction to the a host processor for accessing the storage system [see Casorso column 3 «lines 34-37»].

5> As per claims 2 and 3, Blumenau teaches the table entries further include an indication whether a private state is activated such that the private state for a table entry becomes activated when that table entry contains no shareable mapping information. Data in the particular storage location is restricted from shared, read/write access (fig.8). Blumenau does not explicitly teach invalid state. However, Casorso discloses an invalid state for table entries and preventing access (I|O operations) to the table entry when it is invalid [column 11 «lines 19-24»]. It would have been obvious to one of ordinary skill in the art to modify the teachings of Blumenau to prevent access to a particular portion of the storage location when that location has an error by making the entry state invalid, as taught by Casorso, abstract, column 11 «lines 19-24». One of ordinary skill in the art would have been motivated to add this function to promote data integrity within Blumenau's storage subsystems.

6> As per claims 4-5, Blumenau teaches the table entries further include an indication of whether a no-write state is activated such that the no-write state for one of the entries becomes activated when data cannot be written to the storage location contained in that entry (col. 19, lines 15-21).

7> As per claims 6-7, Blumenau teaches the communication channel [Figure 1 «item 33» : connecting the port adaptor to the storage volumes] to couple the agent and the controller, wherein communication channel employs a data transfer protocol to transport messages on the communication channel (col. 2, lines 19-22).

8> As per claims 8-11, Blumenau teaches the entries include an offset, wherein the offset includes logic unit number identifier (fig. 25, col. 27, Lines 23-24., virtual disk mapping table) and a block identifier (fig. 34), and the entries further includes a segment of virtual disk positions (fig. 8).

9> Claims 12-21 are rejected for similar reasons as claims 1-5 and 8-11. Blumenau further teaches the data frame (block) is about 1 MB (fig. 34). Furthermore, the designation of the size of the data block is merely a design choice. It is well known in the art to assign the data block to any arbitrary size and does not provide any patentable distinction over the prior art.

Blumenau also teaches a plurality of variables such as private/share (fig. 8) and write/no-write Boolean states of the entry (col. 19, Lines 15-21).

10> As per claims 22-23, Blumenau teaches the states include a zero state (col. 22, lines 10-12, null state initially has a zero or null value) and an error state (col. 12, line 20).

11> As per claims 24-25, Blumenau teaches a method for accessing the logical volume on a virtual disk (26, fig. 1) by the host controller (61, fig. 4., host controller is functionally equivalent to agent) coupled to the host (20, fig. 1) within a network (21, fig. 1), comprising: specifying a block (logical unit number or LUN) on the virtual disk (through virtual port - volume 1) within the operation, accessing a table mapping (Figures 23-25) the virtual address to a storage location on a storage device, issuing a corresponding operation to the storage device (part of storage subsystem) (column 8, lines 48-65 where : the operation is a read operation of the storage device), wherein the corresponding operation correlates to the operation on the virtual address (column 25 «lines 50-58» | column 26 «lines 28-36»); completing the corresponding operation', and presenting the completed corresponding operation to the virtual address (column 8 «lines 48-65», column 33 «lines 1-23 and 42-60»).

Blumenau discloses mapping virtual ports (addresses) to physical locations on a drive but does not explicitly disclose mapping virtual disk positions on the storage device.

12> In a same field of invention [Figure 1], Casorso is directed towards providing error check functionality to a dynamically mapped storage system. Additionally Casorso discloses a mapping table, the table having entries to map virtual disk positions to locations on the storage devices [column 1 «lines 37-42» | column 3 «lines 18-38» | column 6 «lines 60-66» | column 8 «lines 5-23»]. It would have been obvious to one of ordinary skill in the art to modified Blumenau's mapping table with the functionality of Casorso's mapping table to enable the mapping of the virtual disk positions to their counterparts on the physical drive.

The benefits of such a mapping are well known in the art such as providing a level of abstraction to the a host processor for accessing the storage system [see column 3 «lines 34-37»].

13› As per claims 26-27, Blumenau teaches updating the table with a persistently-stored table residing in a non-volatile memory (88, fig. 7, col. 16, Lines 27-30) and determining states of the table (fig. 8., storage controller can restrict or permit volume access by host controller by setting the flag to either private or share Boolean states).

14› As per claim 28, Blumenau teaches sending a fault message when the table is unable to be accessed (187, fig. 17).

15› Claim 29 is rejected based on similar reasons as claim 1 addressed above.

16› As per claim 30, Blumenau teaches the storage controller sends updated information of the entries in the mapping table to host controller (agent) (col. 22, Lines 44-47., col. 24, Lines 64 - col. 25, lines 7).

17› Claims 34 are rejected for similar reasons as claims 24 and 31 addressed above.

18› As per claims 36-38, Blumenau teaches the volume access mapping table has the flexibility in assigning a variable number of volumes to each group of blocks of

contiguous memory locations (fig. 5, col. 15, Lines 42-48).

19> As per claims 39-40, Blumenau teaches the table entry comprises a beginning and ending data frames (blocks) (fig. 34).

(10) Response to Argument

I. Rejections Under 35 U.S.C § 103(a)

Claims 1-30, 34 and 36-40 stand rejected under 35 U.S.C § 1039(a) as being unpatentable over Blumenau in view of Casorso. Applicant's arguments specifically address the rejection of claims 1-3, 12, 24 and 31.

A. Claim 1

Applicant argues in substance: (1) that Blumenau and Casorso do not expressly disclose or suggest an agent having volatile memory for storing a first copy of a table; (2) that the references do not disclose a controller having non-volatile memory for storing a second copy of the table; and (3) that the references do not disclose or suggest intermittently causing the contents of the first table to be replaced by contents of the second table.

1. BLUMENAU DISCLOSES AN AGENT HAVING VOLATILE MEMORY FOR STORING A FIRST COPY OF A TABLE.

Applicant broadly asserts that nothing in the cited sections disclose or suggest: "an agent connected to the host, *the agent having volatile memory for storing a first copy of a table,* the table having entries to map virtual disk positions to locations on the storage devices".

Applicant's Appeal Brief, pg. 9, ¶1. Applicant essentially makes the same broad assertion in the remarks after the final rejection. Applicant's Remarks, pg. 4, lines 21-25, 10.24.2005. In the Appeal Brief however, Applicant, using italics, emphasizes the particular section of the limitation as seen above.

In the final rejection, the Office attempted to set forth a clearer mapping between the prior art references and limitations of claim 1 by explaining Blumenau's port adaptor corresponded to the claimed agent and his storage volume correspond to the claimed controller. Final Rejection, pg. 3, ¶2, 10.6.2005. In his response and brief, Applicant does not attempt to explain why Blumenau fails to teach the claimed elements.

Contrary to Applicant's assertions, Blumenau discloses: an agent connected to the host [Figure 4 «items 22 and 35» where : Blumenau's port adaptor corresponds to claimed agent], the agent having volatile memory for storing a first copy of a table [column 14 «lines 14-33» | column 25 «lines 50-54»], the table having entries to map virtual addresses (ports) to locations on the storage devices [Figures 23-25, 30]. Applicant does not address the mapping of Blumenau's elements to the claimed limitations.

Based on the emphasized limitation in Applicant's brief, the Office is left to presume that this particular italicized limitation - an agent having volatile memory for storing a first copy of a table - represents Applicant's primary disagreement with the prior art references. Volatile memory is well known in the art as "any memory, such as RAM, that loses its data when the power is shut off". Microsoft Computer Dictionary, 5th Edition (2002), p. 558.

Here, Blumenau expressly discloses that his port adaptor contains random access memory to store volume access and mapping information. Blumenau, Figure 4 «items 35 and

77, column 25 «lines 50-51». As discussed above, the Office interprets Blumenau's port adaptor as an agent. Blumenau's mapping information corresponds to Applicant's claimed table. Thus, Blumenau discloses an agent having volatile memory for storing a first copy of the table.

2. BLUMENAU DISCLOSES AN AGENT HAVING NON-VOLATILE MEMORY FOR STORING A SECOND COPY OF THE TABLE.

Applicant broadly asserts that the prior art references disclose: "a controller coupled to the agent, the controller having non-volatile memory for storing a second copy of the table". Appeal Brief, pg. 10, ¶ 2. Applicant does not provide any basis for his assertion or explanation for why the position taken in the final rejection in regards to the Blumenau reference is incorrect.

Contrary to Applicant's assertions, Blumenau discloses the elements as claimed. Blumenau discloses: a controller coupled to the agent. [Figure 1 «items 26 and 35» where : Blumenau's storage volume corresponds to a controller is coupled to the port adaptor through item 33»], the controller having memory for storing a second copy of the table [column 14 «lines 31-33» : where Blumenau's back-up table correspond to a second copy]. Blumenau discloses that controller utilizes non-volatile memory but does not expressly disclose that the table is stored in non-volatile memory. Blumenau, column 16 «lines 50-54».

Further, one of ordinary skill in the art would reasonably infer that the backup table would be stored on a non-volatile memory, as opposed to volatile memory. Non-volatile memory is "a storage system that does not lose data when power is removed from it...the

term is occasionally used in reference to disk subsystems as well". Microsoft Computer Dictionary at pg. 367.

Here, Blumenau's storage volume is a disk subsystem. Further, it would completely defeat the purpose of having a back-up table if it is stored in memory that loses data when power is removed, such as with volatile memory. One of ordinary skill in the art would understand that Blumenau's storage volume would store back-up data in non-volatile memory as it would be most beneficial to store back-up data in memory that is persistent and could survive power outages, such as with non-volatile memory. In this manner, the back-up table would be better able to achieve its intended purpose of supporting the primary table when it fails. Thus, as Applicant does not provide any explanation for why Blumenau's elements fail to teach the claimed elements, the Office submits that Blumenau discloses the controller and second copy of the table as claimed for the reasons stated above.

3. BLUMENAU SUGGESTS INTERMITTENTLY CAUSING CONTENTS OF THE FIRST TABLE TO BE REPLACED BY CONTENTS OF THE SECOND TABLE.

Applicant argues that Blumenau fails to suggest that the controller intermittently causes contents of the first table to be replaced by contents of the second table. The limitation is obvious in light of Blumenau's teachings [the final rejection stated that the limitation was inherent in Blumenau, however, this was an error and should read "obvious"]. As previously discussed, Blumenau discloses storing two copies of a mapping table, one copy stored in volatile memory of the port adaptor, one back-up copy stored in the non-volatile memory of a storage volume.

Blumenau discloses the back-up copy is especially useful for "port adapter error recovery". Blumenau, column 21 «lines 35-40». Blumenau further discloses a purpose of his invention is to make it "possible to back up and restore the host-to-volume connectivity configuration information". Id. at column 45 «lines 3-4». A reasonable implication to one of ordinary skill in the art is that the back-up copy of the table is for restoring the primary table if the primary table has any errors. Thus, it would have been obvious from Blumenau's teachings that whenever the primary table fails or suffers from an error, the backup table allows for recovery by restoring the data of the primary table.

It should be noted that Applicant's specification or claims do not expressly define the term "intermittently" but relies on this term to describe when contents of the first are to be replaced. The term is interpreted consistent with the Applicant's specification. MPEP § 2111. Applicant's specification discloses the contents of a first table are generally replaced when attempting to recover from an error. Applicant's specification, pg. 14, lines 7-11. Consistent with Applicant's specification, a reasonable interpretation of "intermittently" is whenever the primary table needs to receive a replacement entry when the primary table has an error. Thus, Blumenau's disclosure of providing a back-up copy of a table in providing error recovery and restoration of configuration information reads on the claimed limitation.

B. Claim 2

Applicant argues that Blumenau does not disclose or suggest the limitation of "the table entries further include an indication of whether an invalid state is activated such that the invalid state for a table entry becomes activated when that table entry contains no useable

mapping information". Casorso was utilized to teach error check functionality for mapping tables in storage subsystems similar to the one in Blumenau. Final Rejection, pg. 6, ¶ 1.

Casorso, in fact, discloses the limitations of claim 2. Casorso discloses:

"the control unit 101 marks the virtual track instance that is stored in the redundancy group as invalid in order to assure that the logical location at which this virtual track instance is stored is not accessed in response to another host processor 12 attempting to read or write the same virtual track".

Casorso, column 11, lines 19-24.

A table entry corresponds to the virtual track. Id. at Figure 3, column 8 «lines 5-23». Casorso thus discloses that each table entry (or track) may be marked as invalid when that entry is not useful so as to prevent other hosts from attempting to read from that track. This functionality reads on the limitations of claim 2.

Casorso states that the benefit of having such an error checking system is to provide a level of data integrity in its storage volumes. Id. at column 2 «lines 28-44». Thus, Casorso provides motivation to incorporate table error-checking functionality into Blumenau's system.

C. Claim 3

Casorso was utilized to teach error check functionality for mapping tables in storage subsystems similar to the one in Blumenau. Final Rejection, pg. 6, ¶ 1. Casorso discloses the limitations of claim 3. Casorso discloses not allowing the host to complete I|O operations with one of the entries if the invalid state for that entry is activated [column 11 «lines 19-24»]. Casorso states that the benefit of having preventing access to the entries is to provide a level of data integrity in its storage volumes and host systems. Id. at column 2 «lines 28-44». Thus,

Casorso teaches incorporating a table error-checking functionality for preventing Blumenau's hosts to complete access operations to an invalid entry. Casorso provides motivation for improving Blumenau's system to insure that the data retrieved by host systems from the table are not invalid.

D. Claim 12

Applicant merely recites limitations of claim 12:

"an agent connected to a host computer, the agent having a volatile memory module for storing a first copy of a table having entries to map a virtual disk position to a storage location on the storage devices and a plurality of variables indicating states of the respective entries" and "a controller coupled to the agent, the controller having non-volatile memory for storing a second copy of the table, the controller intermittently causing contents of the first copy of the table to be replaced by contents of the second copy of the table"

Appeal Brief, pg. 12, ¶ 3.

It should be noted that claim 12 does not have these limitations. Applicant reasserts the arguments made in regards to claim 1 of the brief. The Office assert the response to these arguments in regards to claim 1, section A of this answer.

E. Claims 24 and 34

Applicant specifically argues that Blumenau fails to disclose "specifying a block on the virtual disk within the operation" and "accessing a table mapping the block to a storage location on a storage device". Appeal Brief, pg. 13, ¶ 4. Applicant does not address the teaching provided by Casorso. Contrary to Applicant's argument, Blumenau discloses both of the limitations as claimed.

Blumenau discloses partitioning storage volumes utilizing virtual ports. Blumenau, Figure 25. The partitions, defined by the virtual ports, in essence become virtual storage areas. Id. column 24 «lines 10-22». To perform an operation on these virtual storage areas require specifying the blocks on the virtual disk. Id. at Figure 6, column 16 «lines 3-15». As described by Applicant in his background, "blocks" is merely a method of referring to a partition of a storage system. Applicant's specification, pg. 2, lines 4-5. In Blumenau, a "volume" represents a partition of the storage subsystem. Blumenau, column 8 «lines 28-29». Thus, Blumenau's discloses an operation of being able to search by specifying a volume on the virtual disk. This functionality reads on the limitation as claimed.

Additionally, Blumenau discloses accessing a table mapping the block to a storage location on a storage device. Blumenau, column 10 «lines 56-60», column 22 «lines 41-59» (mapping the volumes to a storage location as presented by the logical unit number (LUN)). Furthermore, Casorso discloses a mapping table, the table having entries to map virtual disk positions to locations on the storage devices. Casorso, column 1 «lines 37-42» | column 3 «lines 18-38» | column 6 «lines 60-66» | column 8 «lines 5-23». It would have been obvious to one of ordinary skill in the art to modified Blumenau's mapping table with the functionality of Casorso's mapping table to enable the mapping of the virtual disk positions to their counterparts on the physical drive. The benefits of such a mapping are well known in the art such as providing a level of abstraction to the a host processor for accessing the storage system [see column 3 «lines 34-37»].

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Dohm Chankong

March 1, 2006

Conferees:

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BUNJOB JAROENCHONWANIT
SUPERVISORY PATENT EXAMINER

DAVID WILEY
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 2100